[Abstract]
[Object]

To provide an image input device capable of decoding a barcode with respect to an image in a state that information concerning the barcode included in the image is not impaired.

[Solution]

An image optically read by an image reading sensor 101 is converted into a digital signal. The digital signal is input to a first image processor 104 and is applied with shading correction by the first image processor 104, and then is input as image data to a second image processor 104 and to a digitizing unit 107 for reading a barcode. The second image processor 105 performs resolution conversion on the input image data. The digitizing unit 107 for reading a barcode digitizes the input image data, and the digitized data is input to a decoder 108. The decoder 108 detects a barcode from the digitized data, and decodes the detected barcode.

[Claims]
[Claim 1]

An image input device capable of inputting an image including a barcode, comprising:

image reading means for reading the image;

first image processing means that obtains the image data read by the image reading means and performs first image processing on the obtained image data;

second image processing means that obtains the image data which was subjected to the first image processing, and performs second image processing on the obtained image data; and

decoding means that obtains the image data which was subjected to the first image processing from the first image processing means, and performs decoding to retrieve information indicated by a barcode from the obtained image data.
[Claim 2]

The image input device according to Claim 1, further comprising:

an external device, which is connected with the image input device, for displaying or storing the image data which was subjected to the second image processing; and

output means that outputs the image data, which was subjected to the second image processing, to the external device.
[Claim 3]

The image input device according to Claim 2, wherein the decoding means performs decoding almost at the same time as the output means outputting the image data which was subjected to the second image processing.
[Claim 4]

The image input device according to Claim 2, wherein the output means obtains the information, indicated by the barcode, which is acquired by the decoding means and outputs the information to the external device, and the external device displays or stores the information indicated by the barcode.
[Claim 5]

The image input device according to Claim 1, wherein the first image processing means performs shading correction, and the second image processing means performs resolution conversion.
[Claim 6]

The image input device according to Claim 1, further comprising a third image processing means that performs image processing suitable for decoding the barcode, wherein

the third image processing means performs, on the image data which was subjected to the first image processing, image processing suitable for decoding the barcode, and outputs to

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the decoding means the image data which was subjected to the image processing.

[Claim 7]

The image input device according to Claim 6, wherein the third image processing means performs gamma correction as image processing suitable for decoding the barcode.

[Claim 8]

An image input method for inputting an image including a barcode, comprising the steps of:

reading the image;

obtaining image data acquired through the reading, and performing first image processing on the obtained image data;

obtaining image data which was subjected to the first image processing, and performing second image processing on the obtained data; and

obtaining image data which was subjected to the first image processing, and performing decoding to retrieve information indicated by the barcode from the obtained image data.

[Claim 9]

The image input method according to Claim 8, further comprising the step of outputting the image data, which was subjected to the second image processing, to an external device for displaying or storing the image data which was subjected to the second image processing.

[Claim 10]

The image input method according to Claim 9, wherein decoding a barcode is performed almost at the same time as outputting the image data which was subjected to the second image processing.

[Clam 11]

The image input method according to Claim 8, further comprising the step of outputting information indicated by the barcode acquired by the decoding means to the external device, the external device displaying or storing the information indicated by the barcode.

[Claim 12]

The image input method according to Claim 8, wherein the first image processing is shading correction, and the second image processing is resolution conversion.

[Claim 13]

The image input method according to Claim 8, further comprising the step of performing image processing suitable for decoding the barcode on an image data which was subjected to the first image processing, wherein

decoding is performed on the image data which was subjected to image processing suitable for decoding the barcode.

[Claim 14]

The image input method according to Claim 13, wherein the image processing suitable for decoding the barcode is gamma correction.

[Detailed Description of the Invention]

[0001]

[Technical Field]

The present invention relates to an image input device and an image input method capable of inputting an image including a barcode.

[0002]

[Background Art]

Conventionally, in an image input device capable of reading an image including a barcode, inputting the image, and performing decoding to retrieve information indicated by the barcode included in the image, image processing including gamma correction and resolution conversion is performed on the read image, and the processed image is transmitted to a PC (host computer) and the like as image information. Through the image processing, an image suitable for being displayed on the PC or being stored can be obtained. Further, decoding of a barcode is performed in the PC using software. In decoding, a barcode portion is extracted from the bit data map of the received image information and the extracted barcode portion is analyzed,

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whereby the barcode information is retrieved.

[0003]

[Problem to be solved by the Invention]

In the conventional image input device described above, however, as image processing including gamma correction and resolution conversion is performed on an image in order to obtain an image suitable for being displayed on a PC or being stored, the correct information regarding the barcode included in the image might be damaged by the image processing. Consequently, when decoding is performed to the barcode included in the image which was subjected to image processing, there is a possibility that the correct barcode information cannot be retrieved.

[0004]

An object of the present invention is to provide an image input device and an image input method capable of decoding a barcode with respect to an image in a state that information concerning the barcode included in the image is not impaired.

[0005]

[Means for Solving the Problem]

The invention according to Claim 1 is an image input device capable of inputting an image including a barcode, including image reading means for reading the image; a first image processing means that obtains the image data read by the image reading means and performs first image processing on the obtained image data; a second image processing means that obtains the image data which was subjected to the first image processing and performs second image processing on the obtained image data; and a decoding means that obtains the image data which was subjected to the first image processing from the first image processing means and performs decoding to retrieve information indicated by a barcode from the obtained image data.

[0006]

The invention according to Claim 2 is the image input device according to Claim 1, further including an external device for displaying or storing the image data which was

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subjected to the second image processing, and an output means that outputs to the external device the image data which was subjected to the second image processing.
[0007]

The invention according to Claim 3 is the image input device according to Claim 2, in which the decoding means performs decoding almost at the same time as the output means outputting the image data which was subjected to the second image processing.
[0008]

The invention according to Claim 4 is the image input device according to Claim 2, in which the output means obtains the information, indicated by the barcode, which is acquired by the decoding means and outputs the information to the external device. The external device displays or stores the information indicated by the barcode.
[0009]

The invention according to Claim 5 is the image input device according to Claim 1, in which the first image processing means performs shading correction, and the second image processing means performs resolution conversion.
[0010]

The invention according to Claim 6 is the image input device according to Claim 1, further including a third image processing means that performs image processing suitable for decoding the barcode, in which the third image processing means performs, on the image data which was subjected to the first image processing, image processing suitable for decoding the barcode, and outputs to the decoding means the image data which was subjected to the image processing.
[0011]

The invention according to Claim 7 is the image input device according to Claim 6, in which the third image processing means performs gamma correction as image processing suitable for decoding the barcode.
[0012]

The invention according to Claim 8 is an image input method for inputting an image including a barcode, including the steps of reading the image; obtaining image data acquired through the reading, and performing first image processing on the obtained image data; obtaining image data which was subjected to the first image processing, and performing second image processing on the obtained data; and obtaining image data which was subjected to the first image processing, and performing decoding to retrieve information indicated by the barcode from the obtained image data.
[0013]

The invention according to Claim 9 is the image input method according to Claim 8, further comprising the step of outputting the image data, which was subjected to the second image processing, to an external device for displaying or storing the image data which was subjected to the second image processing.
[0014]

The invention according to Claim 10 is the image input method according to Claim 9, in which decoding of a barcode is performed almost at the same time as outputting the image data which was subjected to the second image processing.
[0015]

The invention according to Claim 11 is the image input method according to Claim 8, further comprising the step of outputting information indicated by the barcode acquired by the decoding means to the external device. The external device displays or stores the information indicated by the barcode.
[0016]

The invention according to Claim 12 is the image input method according to Claim 8, in which the first image processing is shading correction, and the second image processing is resolution conversion.
[0017]

The invention according to Claim 13 is the image input method according to Claim 8, further comprising the step of

performing image processing suitable for decoding the barcode on image data which was subjected to the first image processing, in which decoding is performed to the image data which was subjected to image processing suitable for decoding the barcode.

[0018]

The invention according to Claim 4 is the image input method according to Claim 13, in which the image processing suitable for decoding the barcode is gamma correction.

[0019]

[Embodiments of the Invention]

Embodiments of the present invention will be described below with reference to the drawings.

[0020]

(First Embodiment)

Fig. 1 is a block diagram showing the configuration of a first embodiment of an image input device according to the present invention.

[0021]

As shown in Fig. 1, the image input device includes an image reading sensor 101 for optically reading a document image. The image reading sensor 101 outputs the image read optically as an optical signal, and the optical signal is converted into an electric signal by a photoelectric converter 102. The electric signal is converted into an 8-bit digital signal by an A/D converter 103, and the digital signal is input to a first image processor 104. The first image processor 104 performs first image processing on the input digital signal. In the first image processing, shading correction is performed to adjust non-uniformity of the light quantity of the light source and non-uniform sensor output caused in the image reading sensor 101. The first image processor 104 may have functions to perform black level correction for correcting non-uniformity in the black level of the image and limit correction by applying a limiter to pixels having the luminance exceeding the 8-bit maximum value.

[0022]

The digital signal which was subjected to the first image processing is input as 8-bit image data to a second image processor 105 and to a digitizing unit 107 for reading a barcode. The second image processor 105 performs second image processing on the input image data. In the second image processing, resolution conversion including thinning out and repeating is performed. Through the second image processing, the image data is converted into image data of an arbitrary resolution, and the image data in which the resolution has been converted is input to an image output unit 106. The image output unit 106 is connected with a monitor (not shown) and a storage device (not shown), and outputs the input image data to display on the monitor or to store in the storage device.

[0023]

The digitizing unit 107 for reading a barcode digitizes the input image data. Digitizing methods include a method of digitizing 8-bit image data output from the first image processor 104 using a prefixed slice level, a digitizing method using a variable slice level for separating a bar and a space corresponding to the density of the base part and the density of the bar part, and a method of performing digitization by calculating a difference between the densities of the adjacent pixels to thereby extract the change point between the bar and the space.

[0024]

The digitized image data is input to a decoder 108. The decoder 108 detects a barcode from the input digitized data, and decodes the detected barcode. The barcode information acquired through the decoding is input to a barcode information output unit 109. The barcode information output unit 109 is connected with the monitor and the storage device which are also connected with the image output unit 106, and outputs the input barcode information for display on the monitor or for storage in the storage device.

[0025]

In the present embodiment, because the image data is digitized and the barcode is decoded before the image data is subjected to resolution conversion including thinning out and repeating as described above, information concerning the barcode (correct information of the width of a bar or a space) will not be impaired by the resolution conversion. Therefore, image data can be digitized in a state that information concerning the barcode is not impaired, so accurate barcode information can be obtained. In other words, decoding of the barcode can be performed in a state that the information concerning the barcode is not impaired.

[0026]

(Second Embodiment)

Next, a second embodiment of the present invention will be described with reference to Figs. 2 to 4. Fig. 2 is a block diagram showing the configuration of the second embodiment of the image input device according to the present invention, Fig. 3 shows one of the gamma curves used for the image input device of Fig. 2, and Fig. 4 shows another gamma curve used for the image input device of Fig. 2.

[0027]

As shown in Fig.2, the image input device includes an image reading sensor 401 for optically reading a document image. The image reading sensor 401 outputs the image read optically as an optical signal, and the optical signal is converted into an electric signal by a photoelectric converter 402. The electric signal is converted into an 8-bit digital signal by an A/D converter 403, and the digital signal is input to a first image processor 404. The first image processor 404 performs first image processing on the input digital signal. In the first image processing, shading correction is performed to adjust non-uniformity in the light quantity of the light source and non-uniform sensor output caused in the image reading sensor 401. The first image processor 404 may have functions to perform black level correction for correcting non-uniformity in the black level of the image and to perform limit correction.

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by applying a limiter to pixels having luminance exceeding the 8-bit maximum value.

[0028]

The digital signal which was subjected to the first image processing is input as 8-bit image data to a second image processor 405 and to a third image processor 407. The second image processor 405 performs second image processing on the input image data. The second image processing includes gamma correction, through which the input image data is converted to have a density suitable for being displayed or stored. The image data in which the density has been converted is input to an image output unit 406. The image output unit 406 outputs the input image data for display on a monitor (not shown) or for storage in a storage device (not shown).

[0029]

The third image processor 407 performs gamma correction and the like on the input image data in order that the bar part and the space part of the bar code can be separated easily when the barcode is digitized by a digitizing unit 408 for reading a barcode provided in the subsequent stage. In the gamma correction, a gamma curve shown in Fig. 3 is used if a difference between the densities of the bar and the space in the barcode portion of the input image data is large. On the other hand, if the color of the bar in the barcode portion is pale, or if the color of the bar is one other than black and cannot be easily read by the image reading sensor 401, a difference between the densities of the bar and the space becomes small, so a gamma curve shown in Fig. 4 is used. With the gamma curve shown in Fig. 4, a difference between the densities of the bar and the space can be increased.

[0030]

The image data which was subjected to the gamma correction is input to the digitizing unit 408 for reading a barcode, and the digitizing unit 408 for reading a barcode digitizes the input image data. Digitizing methods include a method of digitizing 8-bit image data output from the third image

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processor 408 using a prefixed slice level, a digitizing method using a variable slice level for separating a bar and a space corresponding to the densities of the base part and the bar part, and a method of performing digitization by calculating a difference between the densities of the adjacent pixels to thereby extract the change point between the bar and the space.
[0031]

The digitized image data is input to a decoder 409. The decoder 409 detects a barcode from the input digitized data, and decodes the detected barcode. The barcode information acquired through the decoding is input to a barcode information output unit 410 which outputs the input barcode information to display on the monitor or to store in the storage device. The monitor and the storage device are connected with the image output unit 406, respectively.
[0032]

In the present embodiment, as image data is subjected to gamma correction suitable for digitization (third image processing) before being subjected to gamma correction suitable for display or storage (second image processing) as described above, digitization can be performed on the image data having a density suitable for digitization, regardless of the density of the image data which was subjected to gamma correction suitable for display or storage (second image processing).
[0033]

[Effects of the Invention]

As described above, the image input device of the present invention includes an image reading means for reading the image, a first image processing means that obtains the image data acquired by the image reading means and performs first image processing on the obtained image data, a second image processing means that obtains the image data which was subjected to the first image processing and performs second image processing on the obtained image data; and a decoding means that obtains the image data which was subjected to the first image processing from the first image processing means and performs decoding to

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retrieve information indicated by a barcode from the obtained image data. Therefore, decoding of a barcode can be performed with respect to an image in which information about the barcode included in the image is not impaired.
[0034]

Further, the image input device includes a third image processing means that performs image processing suitable for decoding the barcode. The third image processing means performs, on the image data which was subjected to the first image processing, image processing suitable for decoding the barcode, and outputs to the decoding means the image data which was subjected to the image processing. Therefore, even if a barcode included in an image is in a condition that it is difficult to be read by the image reading means for example, a barcode image suitable for decoding can be acquired.
[0035]

Further, the image input method of the present invention includes the steps of reading an image; obtaining image data acquired through the reading, and performing first image processing on the obtained image data; obtaining image data which was subjected to the first image processing, and performing second image processing on the obtained data; and obtaining image data which was subjected to the first image processing, and performing decoding to retrieve information indicated by the barcode from the obtained image data. Therefore, decoding of a barcode can be performed with respect to an image in which information about the bar code included in the image is not impaired.
[0036]

Further, the method further includes the step of performing image processing suitable for decoding a barcode on image data which was subjected to the first image processing, and decoding is performed on image data which was subjected to image processing suitable for decoding the barcode. Therefore, even if a barcode included in an image is in a condition that it is difficult to be read by the image reading means for example,

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a barcode image suitable for decoding can be acquired.

[Brief Description of the Drawings]

Fig. 1 is a block diagram showing the configuration of the first embodiment of the image input device according to the present invention.

Fig. 2 is a block diagram showing the configuration of the second embodiment of the image input device according to the present invention.

Fig. 3 shows one of the gamma curves used for the image input device of Fig. 2.

Fig. 4 shows another gamma curve used for the image input device of Fig. 2.

[Description of Reference Numerals]

101, 401 image reading sensor

104, 404 first image processor

105, 405 second image processor

106, 406 image output unit

107, 408 digitizing unit for reading a barcode

108, 409 decoder

109, 410 barcode information output unit

408 third image processor